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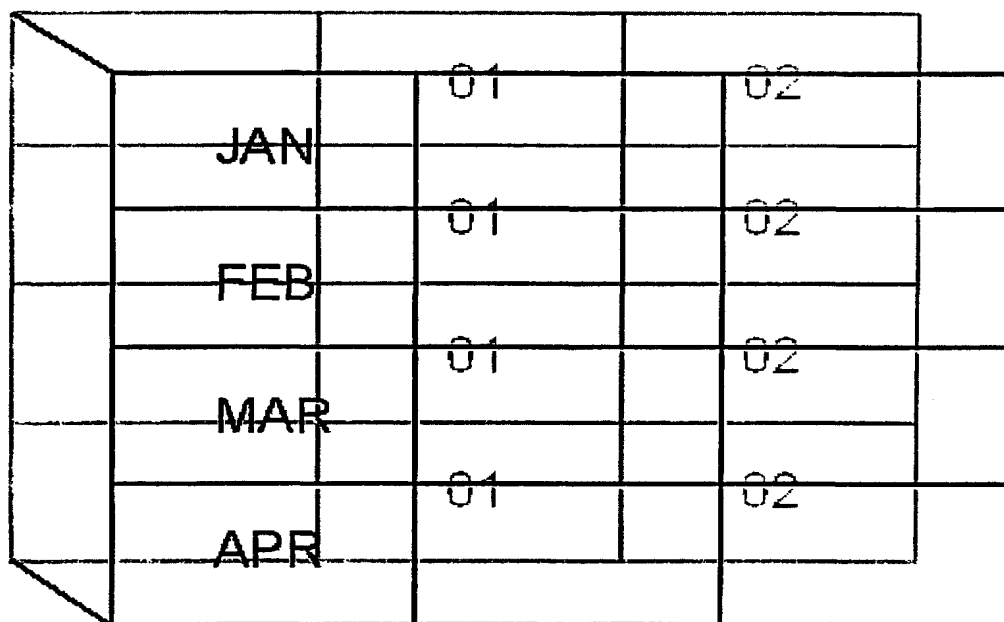
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[Continued on next page]

(54) Title: DATA DISPLAY FOR MULTIPLE LAYERED SCREENS



(57) Abstract: A method of displaying data on a multilevel screen display assigns screen designation codes to respective groups of data, to determine the physical screen on which each group of data is displayed. The screens may comprise layered liquid crystal displays. The method is suitable for spreadsheet software, where a user is able to see overlaying spreadsheets simultaneously.

WO 01/15128 A1



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

DATA DISPLAY FOR MULTIPLE LAYERED SCREENS

TECHNICAL FIELD

This invention relates to data display.

BACKGROUND ART

5 Reference throughout this specification shall be made to use of the present invention in relation to the display of data in spreadsheets. However, it should be appreciated that aspects of the present invention can be used in relation to displaying data presented in other formats, perhaps graphically or in some other format for displaying in particular relational data.

10 There are a number of spreadsheet programs, one of the more prolific being Microsoft Excel™. These spreadsheet programs have a number of cells in rows and columns into which data can be input. Often the cells within the spreadsheet are related to each other.

For example, there may be a cell that displays a number which is calculated from the
15 numbers represented in other cells in the spreadsheet. For instance, this particular cell may represent the total of a column of numbers. Any change to the numbers in that column will also be reflected in that cell representing the total.

This system works well when all of the data required to be reviewed can fit onto one computer screen display. However, often the user of the software creates spreadsheets
20 which have more data entered into them than can be shown on one screen display at a time.

To accommodate this need, spreadsheet software often includes a facility akin to an old-fashioned system of having separate sheets of paper or cards except this is

displayed on the computer, accessed by a virtual tab. For example, the screen may show one set of data. By clicking on a tab, a second set of data is then displayed on the screen with the first set of data being hidden by the second.

5 Unfortunately, this is still unsatisfactory. This is because the screen does not show all of the data that the user may wish to see. While the user can choose which spreadsheet to view, the user cannot see the effect that changing a cell on one spreadsheet has on another cell on the other spreadsheet.

10 Another problem is that it can take some time for a user to locate a particular cell. Not only is this another attempt to address the situation has been the ability to include multiple files on a screen which may be cross-linked in terms of having relational data. Thus, it is possible for the user to alter data on one part of the screen in relation to one file and see its effect on another part of the screen in relation to another file.

15 Unfortunately, these attempts are still unsatisfactory. One problem with this system is that although there may be inter-relational data, there is no physical feel of the relationship between the cells.

For example, on each spreadsheet there may be cells relating to similar data in the same columns and rows for each spreadsheet. However, positioning the spreadsheets beside each other on the screen does not provide an intuitive feel of the relationship of the cells to each other.

20 Another problem that occurs is that often the single cell has two lots of data assigned to it. One data element is the actual number and the other data element is the formula or relationship equation which generates that number. In traditional spreadsheet programs, the formula is usually only displayed when that particular cell is selected. Therefore, the formula for a number of related cells cannot be displayed at the same
25 time. This is understandably frustrating, particularly when a person is desirous of

quickly viewing and assessing the relationship between a number of cells to each other.

It is an object of the present invention to address the foregoing problems or at least to provide the public with a useful choice.

Further aspects and advantages of the present invention will become apparent from the
5 ensuing description which is given by way of example only.

DISCLOSURE OF INVENTION

According to one aspect of the present invention there is provided a method for creating a visual effect in the display of software wherein the

software is for the manipulation of data,

10 the method characterised by the steps of

- a) assigning a particular screen designation code to a first group of data, and
- b) assigning other screen designation codes to second and other groups of data as desired,

wherein the screen designation code determines which physical screen the group of
15 data is displayed in a multi-level screen display.

As stated previously, the software in preferred embodiments is spreadsheet software, although it should be appreciated that the principles of the present invention can apply to other types of software, particularly those which relate to the display of data, such as databases, graphical analysis and so forth.

20 The term second and other group of data may cover such items as formula, relational information, highlights, error messages, hints and so forth which can be associated with the first group of data.

The screen designation code is merely a code that identifies which physical screen the image or software component is displayed upon.

The inventors of the present invention also invented a multi-level screen display and this is described in detail in PCT Application Nos. PCT/NZ98/00098 and
5 PCT/NZ99/00021.

This is a device which is created by combining multiple layers of selectively transparent screens. Each screen is capable of showing an image. In preferred embodiments, the screen layers are liquid crystal displays. Preferably the screens are aligned parallel to each other with a preset distance between them.

10 With this invention, images displayed on the screen furthest from the view (background screen), will appear at some depth behind the images displayed on the screen closest to the viewer (foreground screen). The transparent portions on the foreground screen will allow viewers to see images displayed on the background screen.

15 This arrangement of layering multiple screens allows images to be presented at multiple levels giving the viewer true depth without use of glass or lens.

The present invention will now refer to use with a multi-level screen as described above although this should not be seen as limiting.

The group of data is in preferred embodiments a spreadsheet such as that normally
20 viewed in a spreadsheet program, however this should not be seen as limiting.

It should be appreciated that although reference shall be made throughout this specification now to only background and foreground screens, other aspects of the present invention may utilise more than two screens. For example, various spreadsheets may be on the multiple screens behind the foreground screen.

A group of data may be that information displayed when a particular tab is selected on the screen. Therefore, that group of data or spreadsheet is displayed on one of the physical screens.

5 The group of data or spreadsheet that can be viewed by selecting another tab may be displayed on another physical screen. Alternatively, if there are two separate spreadsheet programs, these can be imported to an embodiment of the present invention and have separate spreadsheets from the separate files shown on the separate screens with one spreadsheet overlaying another, but with the ability to see both.

10 One embodiment of the present invention will be an interface that identifies the coding on existing software with these identifiers and assign various data groups to the appropriate foreground or background screen.

The 'always on top' functions can be made fully or partially transparent by the present invention.

15 In one embodiment of the present invention, one screen may have a highlight for a particular cell or group of cells positioned either in front of or behind that highlight. In a variation of this embodiment, the highlights of a number of cells may be colour coded with the codes corresponding to a particular relationship to cells of a certain type.

20 In another embodiment of the present invention, one group of data on one screen may be the actual values within the cells and the other group or groups of data on the other screens may be the coding or formulas or relational information that actually creates the value shown on the other screen.

25 In some embodiments, the groups of data may all belong to the same large spreadsheet and the second and consequent screens may merely show the wrap-around of that spreadsheet.

In other embodiments, it may be provided in cells a hyperlink that can take the user of the spreadsheet to other cells or other screens.

Sometimes, the present invention may be useful in error tracking. For example, a mistake in the relational formula between the cells or the data entered may lead to an error. The ability to see a number of cells at once can assist in tracking down where the error occurred or what cells are affected by the error.

In one aspect of the present invention there may be provided the ability to scroll through values on one cell or set of cells on a screen while still being able to view another set of cells on another screen. This is particularly useful where it is desired to be able to search for information or data on various areas of the spreadsheet or database while not disturbing the actual region of the spreadsheet or database that the user is working on.

The scrolling or rotation of data on various cells may be achieved in some instances by the use of a track ball or some other user interface.

In yet another embodiment one of the screens may display tips or hints associated with the cells being displayed on the other screen.

The interface may be a patch for existing software, a library file or a new front end for multiple existing software packages or a completely new operating system.

With existing software that does not have such coding, it may be necessary to implement the present invention by having customised software in which the software developer specifies the software routines which cause the appropriate components and images to go on the appropriate screens.

A further aspect of the present invention is the provision of media on to which instructions in accordance with the present invention has been recorded. For example,

this media may be a graphics card, CD, hard drive, floppy disk and so forth.

The advantages of the present invention can now be readily seen.

Because of the physical separation between the screens, the viewer can easily see data on the front screen and on the rear screen as required. Thus, the user can see
5 significantly more data than previously viewable with standard software or standard screens. Indeed the amount of data that the user can see is a multiple proportional to the number of screens in the multi-level screen display.

The viewer can instantly see on which screen holds the cell or data that is relevant to it and select this.

10 The user can also see at a glance the relational nature of the data on the screens. For example, a change on one screen may cause corresponding change on the other screen overlaying it. This gives an instant appreciation of the effect of a change.

In some embodiments of the present invention the cells which change as a consequence of altering data may be colour coded. This allows the user to more
15 quickly identify where that change has occurred on multiple screens.

Some embodiments may have different shading to make it clear as to which screen the group of data is on, or to indicate which data is grouped together. The overall screens may also be shaded/coloured to give visual clarity.

The present invention also allows the user to easily access a desired cell. Not only is
20 this more desirable for the user in terms of mental satisfaction, but this also is significant in terms of physical relief. A problem that frequent computer users have is occupational overuse syndrome (oos) which is the repeated use of muscles, particularly when typing or using a mouse. Easier access means that the mouse is used less in order to find a particular cell and thus a potentially unpleasant medical condition is

avoided.

In some embodiments of the present invention some cells are presented as 3-dimensional blocks which can be selected, moved or removed like blocks in a wall to reveal data on other screens.

5 It can be appreciated that the present invention overall literally provides an added dimension to the ability of a user to work with data manipulation programs such as spreadsheets and databases. There is considerably more flexibility and also a reduction in the time and effort required by the user to see the relationship between groups of data to each other.

10 Aspects of the present invention may extend to other standard functions on a spreadsheet program.

For example, spreadsheet programs often come with the ability to present the data graphically. Thus, for multi-relational data sheets, the present invention can also be used to produce 3-dimensional graphs showing the data on x, y and z axes as required.

15 **BRIEF DESCRIPTION OF DRAWINGS**

Further aspects of the present invention will become apparent from the following description which is given by way of example only and with reference to the accompanying drawings in which:

Figure 1 illustrates a screen display of a prior art spreadsheet software, and

20 Figure 2 illustrates another prior art screen display, and

Figure 3 is a concept drawing showing the 3-dimensional nature of the present invention.

BEST MODES FOR CARRYING OUT THE INVENTION

Figure 1 is a screen display from a Microsoft Excel™ program. This illustrates a group of data on a spreadsheet generally indicated by arrow 1 on the screen. The associated tab (2) indicates that the data we are looking at relates to "FBT Calc –
5 Lease".

The screen also shows that there is a second group of data (not shown) and positioned visually under the first group of data. The indicator that there is a second group of data is the tab (3) which reads "FBT Calc – Lease to Own".

To view the second group of data, it is necessary to select the tab (3). However, in
10 doing so the first group of data is obscured by the second group of data. Thus, the effect of a change on one group of data is not immediately discernable as the user cannot see the other group of data.

It can also be seen that it can be difficult for the user to select a particular cell given that half of the data is obscured at any one time.

15 It should also be appreciated that spreadsheet programs of this type have the ability to have multiple tabs, not just the two shown.

Figure 2 illustrates a screen display whereby two separate files have been imported into the one screen display and are positioned side by side. This enables the user to change data on file and view its corresponding effect on the other file.

20 However, because the files are side by side, this is not intuitive with there being no real physical relationship between cells having the same common row and column. Further, the screen size is still limited and only a certain amount of data can be fitted onto the screen.

The present invention provides for the separate groups of data (whether from separate files of merely separate spreadsheets to be displayed on separate physical screens aligned with each other.

Figure 3 shows an example of a multi-level spreadsheet using only 2 layers.

- 5 Information can be stored on both layers. The layout of the cells can be used to enhance user information by positioning related cells close to or behind one another so as to improve the visual feedback to the user speeding up the development time and improving error detection. The positioning of the cells can also be used to increase the information available on a given cell as illustrated by the text and numbering chosen
- 10 for figure 3. The front screen is ready to receive the monthly information such as income generated or expenses incurred while the back screen provides the user with immediate information about the day on which the income was generated or expense total incurred, thus reducing the need to look away from the cell to gain this information.
- 15 A greater number of layers of course can be used.

The 3-dimensional spreadsheet enables the user to see far greater quantities of data in the one visual display than before.

It also enables the user to quickly select a desired cell. Further, the relational nature of the data to each other can be intuitively perceived.

- 20 Aspects of the present invention have been described by way of example only and it should be appreciated that modifications and additions may be made thereto without departing from the scope of the appended claims.

CLAIMS:

1. A method for creating a visual effect in the display of software wherein the software is for the manipulation of data,

characterised by the steps of
 - a) assigning a particular screen designation code to a first group of data,

and
 - b) assigning other screen designation codes to second and other groups of data as desired,

wherein the screen designation code determines which physical screen the group of data is displayed in a multi-level screen display.
2. A method as claimed in claim 1 wherein the software is spreadsheet software.
3. A method as claimed in either claim 1 or claim 2 wherein the groups of data correspond to a particular tab selected on the screen.
4. A method as claimed in any one of claims 1 to 3 wherein one of the groups of data is formula corresponding to values in the cells in another group of data.
5. A method as claimed in any one of claims 1 to 4 wherein the second or other groups of data is a wrap around or continuation of a page or spreadsheet partially shown in the first group of data.
6. A method as claimed in any one of claims 1 to 5 wherein the second or other groups of data contains highlights or colour coding corresponding to the first group of data.
7. A method as claimed in any one of claims 1 to 6 wherein the second or other

groups of data includes hyperlinks from one part of the display to another part.

8. A method as claimed in any one of claims 1 to 7 wherein the second or other groups of data includes error messages.
9. A method as claimed in any one of claims 1 to 8 wherein the second or other groups of data have the ability in at least parts of them to enable the user to scroll through information on a particular screen.
10. A method as claimed in any one of claims 1 to 9 wherein the second or other groups of data contains tips or useful information pertaining to the first group of data.
11. Media which carries instructions for the operation of the method substantially claimed and/or described.
12. A method substantially as herein described with reference to and as illustrated by the accompanying drawings.

Microsoft Excel

File Edit View Insert Format Tools Data Window Help

Arial 10 B I U 100% -

B15 = +=FBT Calc - Lease to Own!B15

Name Box: F15

Formula Bar: +=FBT Calc - Lease to Own!B15

	A	B	C	D	E	F	G	H
5	Inflows							
6								
7	GST inflow	6,666.67						
8	1an Paym'ts for Car	2,400.00	2,400.00	2,400.00	2,400.00			
9								
10	Total	9,066.67	2,400.00	2,400.00	2,400.00	2,400.00		
11								
12	Outflows							
13								
14	Lease Payments							
15	Capital	11,367.13	12,175.19	13,003.64	15,213.97			
16	Interest	4916.87	4108.81	2680.36	1070.03			
17	FBT							
18	@24% of \$60,000, less							
19	2,400 x 49%	5,880.00	5,880.00	5,880.00	5,880.00			
20	Tax saving on FBT	- 1,940.40	- 1,940.40	- 1,940.40	- 1,940.40			
21	GST on FBT	1,333.33	1,333.33	1,333.33	1,333.33			
22	Tax Saving on Lease	- 5,373.72	- 4,017.81	- 4,489.20	- 5,020.61			
23	Running Costs							
24	FBT Calc - Lease to Own							
25	FBT Calc - Lease							
Ready								
Start	LAWS	Micros...	Inbox -	Micros...	5g 1 - P	FW lan		16:50

Fig. 1

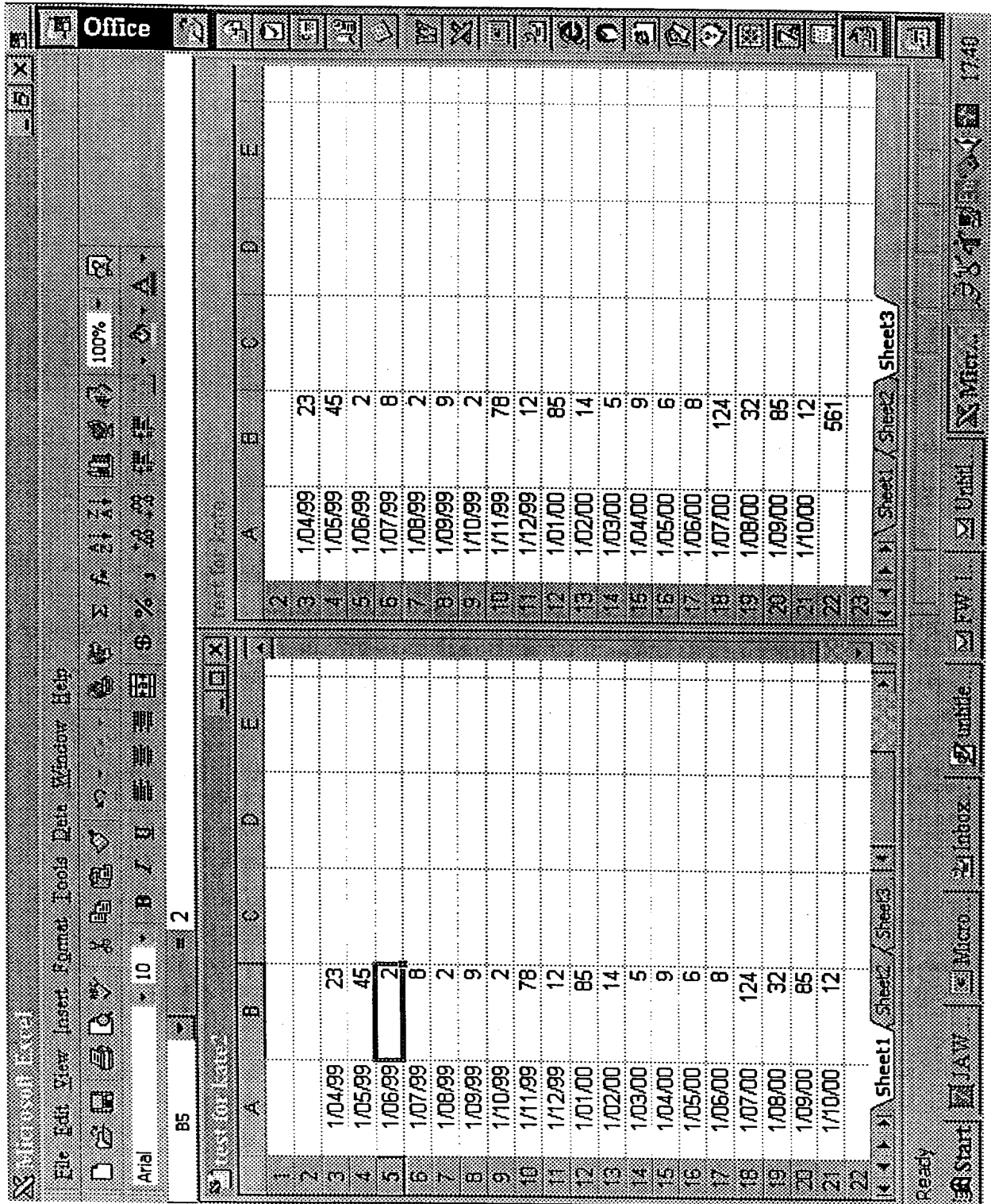


Fig. 2

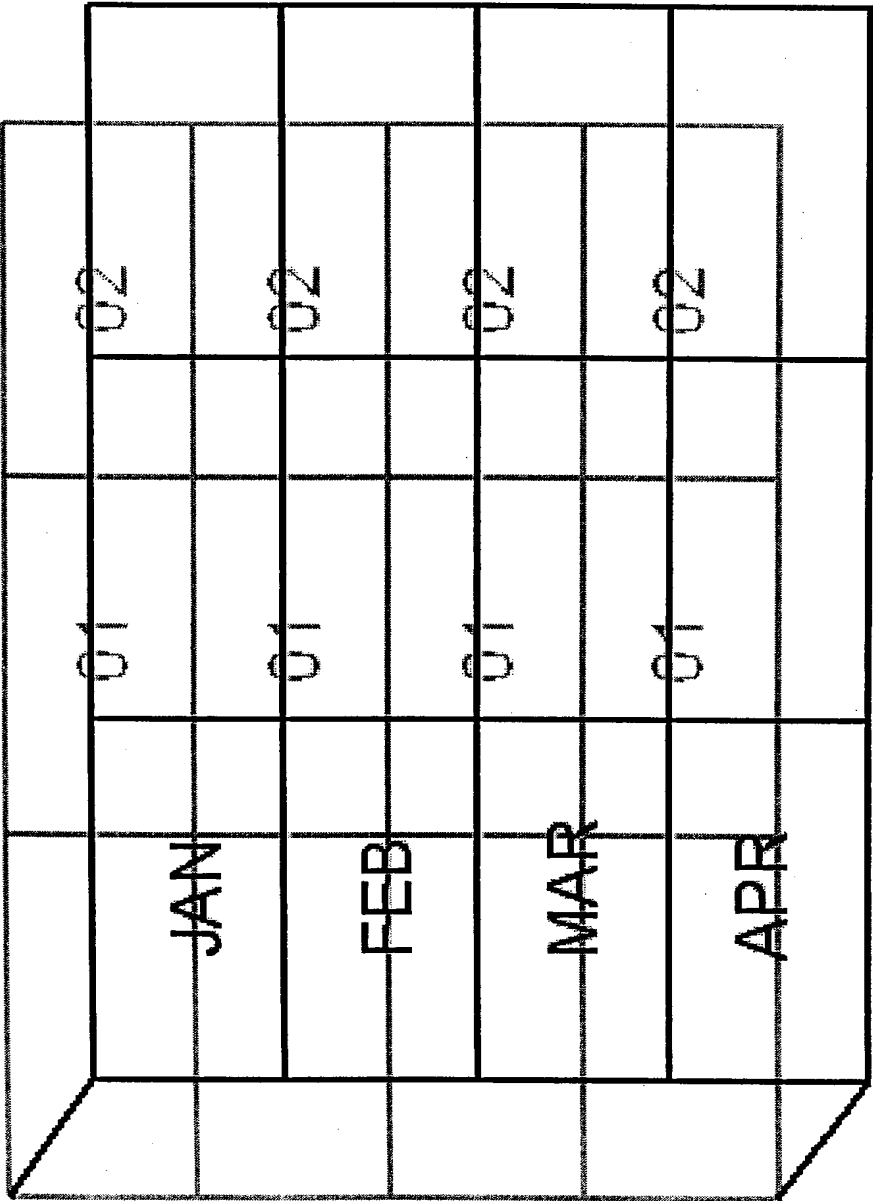


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ00/00162

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. G09G 3/36, 5/397, G06F 19/00, G02F 1/1347

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: G02B, G02F, G06F, G09G, H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

DWPI, JAPIO Keywords: screen, display: overlap, layer, multi; behind, overlap, superimpos, multilevel, layer: graphic, image, data: spreadsheet; program, software, code, driver; three dimensional

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 5764317 A (SADOVNIK ET AL.) 9 June 1998 Columns 7-8, Figures 1-4	1 2-10, 12
X	US 4472737 A (IWASAKI) 18 September 1984 Columns 2-4, Figures 1-3	1
Y	EP 595387 A (INTERNATIONAL BUSINESS MACHINES CORPORATION) 4 May 1994 Whole document	2-10, 12

☒ Further documents are listed in the continuation of Box C ☒ See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an

"Y"

inventive step when the document is taken alone document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search

15 December 2000

Date of mailing of the international search report

29 DEC 2000

Name and mailing address of the ISA/AU

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ00/00162

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 454423 A (TFE HONG KONG LIMITED) 30 October 1991 Whole document	1
A	Derwent Abstract Accession No. 98-024070/03, Class V04, JP 09-282357 A (ZUKEN KK) 31 October 1997 Abstract	1-10, 12
A	Patent Abstracts of Japan, JP 08-036375 A (SEIKO EPSON CORP) 6 February 1996 Abstract	1-10, 12

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ00/00162

Box I Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims No : 11
because it relates to subject matter not required to be searched by this Authority, namely:
A mere presentation of information (PCT Rule 39.1(v)).
2. ☐ Claims Nos :
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos :
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/NZ00/00162

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report			Patent Family Member		
US	5764317	NONE			
US	4472737	NONE			
EP	595387	JP	6203136	US	5528259
EP	454423	GB	2245092		
JP	9282357	NONE			
JP	8036375	NONE			
END OF ANNEX					